Topological Crystalline Insulator and Anderson Transition

Liang Fu*

Department of Physics, Massachusetts Institute of Technology, USA

***Email of Presenting Author: liangfu@mit.edu**

Abstract

Structure and symmetry play important roles in shaping electronic properties of periodic solids. Recently, it has been shown that the presence of crystalline symmetries leads to new phases of matter dubbed topological crystalline insulators [1], which possess metallic surface states protected by symmetry, with unique and tunable electronic properties. In this talk, I will describe the general concept and theoretical description of topological crystalline insulators, and our theoretical prediction of the material realization of this new phase in the SnTe class of IV-VI semiconductors [2]. The distinct surface states of topological crystalline insulators have now been experimentally observed in SnTe, PbSnSe and PbSnTe.

The protection of surface states against disorder has motivated a re-examination of metal-insulator transition in the two-dimensional symplectic class. I will describe a new field theory for Anderson transition [3], in which topological defects drive localization and the sign of defect fugacity determines the Z2 topological class. Implications for Anderson transitions in other symmetry class will be discussed.

References:

[1] L. Fu, Phys. Rev. Lett. 106, 106802 (2011).

[2] T. H. Hsieh, H. Lin, J. Liu, W. Duan, A. Bansil, and L. Fu, Nat. Commun., 3, 982 (2012).

[3] L. Fu and C. L. Kane, Phys. Rev. Lett. 109, 246605 (2012).

About the speaker

Prof Liang Fu joined the Physics Department of Massachusetts Institute of Technology (MIT) as an Assistant Professor in January 2012. He obtained his bachelor's degree in physics from the University of Science and Technology of China in 2004, and PhD in physics from the University of Pennsylvania in 2009. Before coming to MIT, he was a Junior Fellow at Harvard University.